The Maryland Fruit Grower

Published Monthly
By
THE MARYLAND STATE HORTICULTURAL SOCIETY
College Park, Maryland

Volume 1 April, 1931 Number 3

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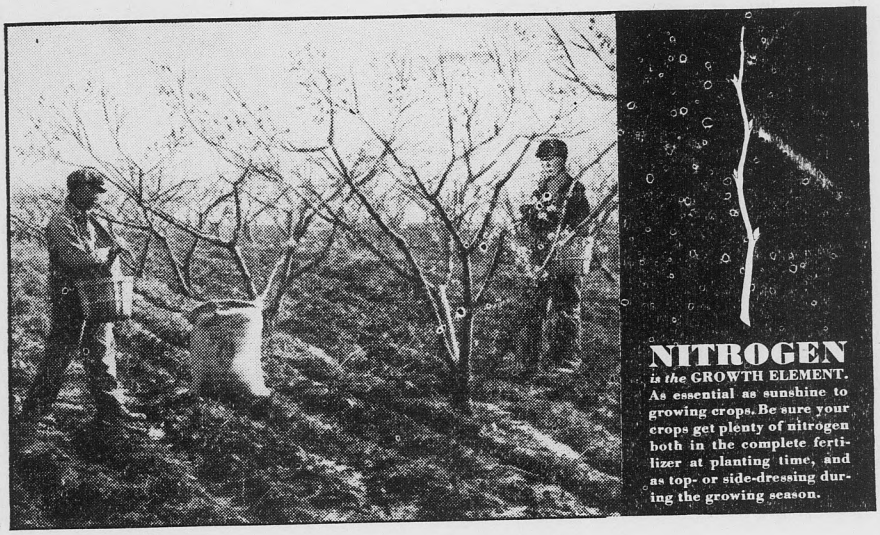
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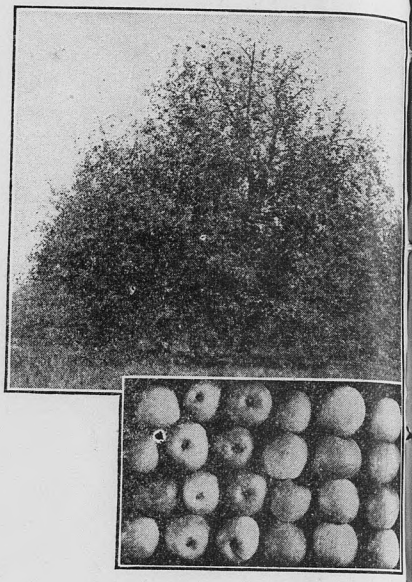

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Abstracts of Recent Bulletins—Dr. A. L. Schrader.

Relation of Foliage to Fruit Size and Quality in Apples and Pears. By J. R. Magness, F. L. Overley, and W. A. Luce. Washington Agricultural Experiment Station Bulletin 249. Feb. 1931. Pullman, Washington.

Do you know that the size, color and quality of each apple or pear depends on the number of healthy leaves which we have on the tree to feed each fruit?

"The leaf is to a large extent the manufacturing establishment in which the raw materials coming from the air and the soil are changed into food materials from which the fruit and wood tissues are built." Careful measurements of individual apples on the trees during the season show that 20 to 30 leaves for each fruit are necessary to produce an apple of commercial size, and 40 to 50 leaves per fruit are needed if we want fruit buds for the next season's crop. Bartlett and Anjou pears also required 20 to 30 leaves to get good size; however, Winter Nellis required twice as many leaves.

The maintenance of a vigorous growth of tree by an available supply of nitrogen, abundance of organic matter and sufficient moisture will maintain a large leaf area. Adjusing the number of leaves per fruit by thinning of the fruit is also essential. It is estimated that the average 20 to 25 year old apple tree will carry 60,000 to 100,000 leaves which means that the crop on such a tree should be limited to 1,500 to 2,500 fruits if best commercial size and quality as well as annual crops are to be obtained.

Stationary Spray Systems in West Virginia. By F. D. Cornell, Jr., West Virginia Agricultural Experiment Station Bulletin 239. Jan. 1931. Morgantown, W. Va.

If you want some information on stationary spray outfits, regarding details and costs of installation as obtained from 13 orchardists in West Virginia and at the experimental farm, you will find a complete discussion in this report. Many advantages of the stationary system are given, including lower cost of spraying per acre, and no greater initial cost over the portable spray equipment. References to other bulletins on stationary spray systems are included.

Bloom Period and Yield of Apples. By E. W. Ellenwood. Ohio Agricultural Experiment Bulletin No. 472. Feb. 1931. Wooster, Ohio.

We often ask the question about the relative blooming periods of our varieties of apples in trying to select the right pollenizers for our orchards. A 20 year blooming record for 159 varieties of apples given in this bulletin furnishes some extensive data. This information is also of value in relation to frost injury at blossoming time.

In years when full bloom occurred several days before normal (1910, 1913, 1921 and 1925) there was a considerable frost injury, serious damage resulting when the temperature dropped 25° F. during full bloom. The bearing habit and bearing age of 26 varieties have been recorded over a 37 year period. The age at which varieties reached profitable production and the average annual yields are valuable records to study. The high yielding varieties include Grimes, Northwestern Greening, Rome Beauty, Ben Davis, Jonathan, Gano, McIntosh and Stayman Winesap. No variety declined in production until 35 years af age.

Those Pruning Tools

Where are your pruning tools? Don't let them get scattered around. Gather them up, clean and oil them, and look at their condition. Some will need repair, tightening, sharpening or new parts. Do you know that the manufacturer of those tools will repair them like new at a very reasonable price? Write and find out about this repair service. A workman is no better than the tools he uses. Good tools save time and money.

What Next?

Most of us have applied fertilizer, and have disked the cultivated orchards, and perhaps one or two sprays are on the trees. We've decided to put cover crops in early, this year, and now is the time to plan the crop to use, and to get the seed and fertilizer ordered. Let's get the cover crop sown by the middle of June at the latest.

The Brush Pile

Many of the Horticultural Society News Letters are passing ugly remarks about the pruning brush this is still lying about the orchards. Here's where bark beetles thrive. Some peach blocks tell a sad story of bark beetle attacks, due to the brush pile nearby. Mr. P. D. Sanders, Extension Entomologist, University of Maryland, has written a short story about the bark beetle. Read it, then get rid of that brush pile.

"There are a large number of insects that bore into the bark and wood of both apple and peach. Most of these insects attack dead trees, or branches or trees that are in weakened condition, or growing slowly. Trees weakened by drought may be attacked more generally than usual. Borers can do great damage, if they get started. Growers should watch carefully for borers and also remove dead trees and burn pruning brush"

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Growing Fruit in a Different Way

By Harold Rogers, Southington, Connecticut, President of the Connecticut Pomological Society

We now have at the farm approximately 8,000 apple trees and 13,000 peach trees, mostly permanents, with about two-thirds of each in productive bearing. Our soil is rather stony, a sort of clay loam underlaid with a shell sand-stone subsoil, which varies in depth from six inches to several feet below the surface of the ground. Our soil responds well to cultivation, fertilization and holds moisture very well. In many places the orchards are surrounded with wood and brush, excellent breeding places for the popular pests and diseases; we have plenty of stone walls dividing fields, although we have gradually removed the more offensive of them to ease the operations as we have afforded the time and money. We are now operating the entire three hundred acres with eight full time men, two horses, three tractors, two sprayers, one duster, five trucks and various other small time-saving tools. I expect within a short time to eliminate the two surviving horses, as I think we can as well do without them as without the six which we have gradually eliminated since 1921. Our harvest in 1930 amounted to approximately 45,000 bushels of apples and 40,000 baskets of peaches, the general harvest organization being strengthened as necessary to take care of the additional rush work.

One of the things most frequently discussed at these meetings is the matter of pruning, upon which we seem for the most part pretty well agreed, so far as theory and fancy are concerned, to the modified leader type of tree. Whre past practices have already developed a scaffold other than the ideal leader type, the pruning is largely a matter of thinning out to a desirable amount of branches and limbs. We find, however, that with the theories and ideals well established in our minds it becomes a rather difficult problem at times to work out a method even for ourselves by which we can accomplish the desired purpose; even more difficult it is to teach some one else the type of pruning which we should like to have done. It becomes necessary therefore for each grower to decide how he will proceed individually to get the type of tree which he desires, to prune at least an occasional tree himself, and to allow his helpers to prune according to a certain model, or mental picture of the ideal to which the grower aspires.

The time spent in the individual tree varies of course with the size, variety, type of pruning, etc. At the present time we are pruning trees which are full grown and mature at 35 years of age. At this age we frequently prune only biennially, as is the case this year. The men work in a full gang or four to six with a foreman and average about six or eight large trees with a spread of nearly forty feet per man per day.

As yet we have not found a brush picker which will do our work satisfactorily and are still picking it up with cheap labor by hand. The cost of picking and burning the brush often amounts to one-third the cost of pruning the tree. Though we do not prune our mature Baldwin trees annually, we prefer to prune McIntosh an dthe young trees carefully each year; we usually remove broken branches and water sprouts from all trees annually during some part of the season.

Our planting distance for the past few years has been established at 45 feet.

Our planting distance for the past few years has been established at in cultivation, as well as all the non-bearing apples and the peach orchards; we have two years of sod and one year of cultivation in the mature apple orchards. This cultivation is affected by heavy tractor drawn harrows, is started in the fall and completed during the following

summer. No additional fertilizer is applied when orchard is in cultivation. Ordinarily we apply from 1½ to 2 tons of lmestone per acre during June or July, work it carefully into the soil by tillage, and seed down in late July or August with a mixture of some five or six types of clover, red-top, timothy and rape.

Pest suppression and spray equipment is always an interesting topic. We spray and we dust, using one as a supplement to the other, and finding a desirable place for both. Thus far we have been able to manage with two sprayers and one or two dusters, but have provided a power operated tank filler, mounted on a motor truck with which we supply ready mixed solution to the sprayers in the field. This supply wagon is much like a spray outfit itself and consists of a 125-gallon per minute centrifugal pump driven by a small gas engine equipped with clutch, a 600 gallon spray tank with agitator directly connected to the engine, independently of the clutch for the pump, two 25 foot lengths of 3-inch hose, all mounted on a steel frame and fairly easily mounted or dismounted from the bed of a three ton truck This tank enables us to mix 600 gallons of solution at the nearest convenient water supply, and to transfer it directly to the orchard under good agitation, where the load is divided between the two sprayers at the rate of 100 gallons per minute. Thus the sprayers are delayed for refilling only about three to five minutes each and do not have a long water haul to delay the applications. We feel that the water supply wagon has several distinct advantages for us, especially in that it increases our efficiency as much as an additional sprayer and eliminates the use of one or two men, not to mention the use of another tractor which is in demand at the spray season for other work. Our sprayers are high pressure, high capacity outfits drawn by crawler tractors which develop ample and steady traction to draw the outfits through the rows at a uniform slow speed. The operators usually, except for the calyx application, ride on the sprayer itself, one working from the top of the tank and one from a suspended platform in the rear. The operator on the tank uses a double quad spray rod with eight 1-16 inch nozzles and directs his efforts to the tops of the trees; the man in the rear, on the platform, sprays only the lower branches and shoots as best he can into the center and far side of the tree. For the calyx spray the tank man must cover all the outside while the man on the ground shoots up from the center of the trees to cover inside surfaces as well as possible; the man on the ground has a single quad of only one-half the capacity used from the tank. By this method we can apply about twelve to fourteen hundred gallons per day per man, and feel satisfied with the economy as well as the control. This totals 4,200 gallons per machine in a 9 hour day.

Our thinning practices have been modified in various ways; we are doubtful if in most cases where pruning has been properly cared for if it is necessary any years to thin our Baldwins; some other varieties, such as Wealthy, Gravenstein, and occasionally a tree of McIntosh, may justify the expense, the damage to many of the branches, and bruising of apples left on the tree. Thinning, however, materially assists in an early grading of the crop and permits the entire strength of the tree to be devoted to the maturity of good apples. Thus it is evident that we must each decide for ourselves whether in our own case conditions make thinning advisable.

The harvesting and storage of a large crop of apples presents one of our greatest problems. We have picked into pails, baskets and picking bags, with careful study of the virtues of each; for McIntosh it seems necessary to harvest into either pails or baskets in order to insure as little bruising as possible. For most other varieties we have found that the picking bag made with the light metal frame somewhat like a pail, with a cloth bottom, works out very nicely, especially when used with crates or storage boxes. Much of the bruising sometimes attributed to picking operations is actually done in the handling after the fruit is picked and before it is marketed.

Our air-cooled storage has proven very satisfactory for the storage

of apples which ripen with or after the Baldwin, but feel it better to send McIntosh, Greening and other earlier varieties to commercial cold storage as soon as harvested if we intend to keep them for the winter market. The ideal combination, of course, would be to have enough of both common and cold storage space on the farm to care for the entire holdings. Our air-cooled storage is of the Pennsylvania type, a rectangular brick building insulated top and sides with granulated and pressed cork, measures 36x125 feet and holds when full about 20,000 bushels in crates. A vestibule 10'x14' feet on either end encloses three sets of doors, the outside doors being tin-coated to resist fire, center doors of screen to admit air without entrance of vermin, and the inner doors of refrigerator type to exclude severe cold. A driveway is thus arranged from end to end of the building by which we can unload directly from trucks to the pile in which apples will be stored until packed. The floor is elevated about eight inches from the earth and is made from fabricated iron, sometimes called subway grating; although rather expensive it is an ideal type for the purpose. Ventilation is admitted through the entrances but is assisted by means of a large fan installed above the ceiling which exhausts the air from the storage room through ceiling, registers one complete change every seven minutes. This exhaust fan has proven a necessary part of the equipment under our conditions, where large amounts of warm fruit must be brought into the storage during harvest. Of course it is not necessary to use the fan a great deal except in the early season, when we wish as rapidly as possible to replace the heat by cooler air during the late fall nights. Thus far we are well pleased with our experience in storing Baldwins and late winter apples in this type of building, and feel that we have made some worthwhile savings in storage expense.

Marketing of the apple crop is demanding more of our attention in late years than in the past, and presents some very difficult problems. There seems to be some competition from adjoining states to the west and south which demand United States standards of grades, to which they are more accustomed and by which apples are scored for export. It is possible that some of our state standards may have to be changed to conform with this demand, and that we may have to mark closed packages under a United States standard. Whatever the standard may be, I endorse rigid grading of all closed packages.

The most interesting but often most neglected part of our duty as orchardists is the careful study of our personal problems in production and marketing; it seems to me that often we spend too much time with heavy tools, such as tractors, sprayers and pruning saws, but in the meantime overlook the importance of the simplest tool of all, which is no more than an ordinary, cheap lead pencil.

From an address before the New Hampshire Horticultural Society, Dec. 4, 1930.

Get your neighbor to join the Society.

84875

THE RELATION OF NITROGEN TO THE STORAGE QUALITY OF FRUIT

J. H. GOURLEY, *Chief, Department of Horticulture,*
Ohio Agricultural Experiment Station, Wooster, Ohio.

The subject under discussion is admittedly a controversial one and sufficient evidence is not at hand to answer the questions involved with finality. Yet so important is it to the fruit growing interests of America that a resumé of the information to date may be useful.

For some twenty years the prevailing fertilizer practice of American orchardists has been the use of inorganic nitrogen only, although most experiment stations have recommended that superphosphate be applied to the land between the trees, whether it is in sod or cultivated. This latter recommendation has not been stressed sufficiently, however. Throughout this period there have been some professional horticulturists and some fruit growers who dissented from the usual advice and urged complete fertilizers for orchards generally. Chemists and soils experts have usually advised complete fertilizer, reasoning from their experience with other crops. Hence orchardists stand practically alone in their assumption that nitrogen will give as satisfactory results as complete fertilizer with fruit trees. As in all other matters, the case should be decided upon the evidence secured from experiments, and an open mind should be maintained, for soil exhaustion may occur and local conditions may vary the crop requirements.

VARYING OPINIONS

As a background we may cite the opinions of a few of those who hold varying views upon this subject, aside from those found in the scientific literature.

In a recent number of Better Fruit, McCollum (6) says "the continued use of it [nitrogen] alone will prove its insufficiency in the near future. . . The use of *small* applications of phosphorus and potash, and in a good many cases the method of application, places these plant foods at a distinct disadvantage from the outset." He cites some demonstration work recently carried on in Virginia which shows with certainty that a complete fertilizer gives the highest yields. Nitrogen and potash, and nitrogen and phosphorus show better response than nitrogen alone."

A letter from an experience dorchardist in the State of Washington (1928) states that—

> "In our district we have used cover crops continuously in many of our orchards since 1920. In addition, great quantities of barnyard fertilizer have been applied and we have built up the nitrogen content of our soil many times over that carried by virgin soils. Gradually our keeping quality, together with color has been falling down each successive season until at present the matter of internal breakdown on Jonathans is quite serious, also the color which of course affects the grades of our fruit as it is packed out are very materially lowered over what they were when the orchards were young. We believe we have secured some very favorable results with the use of phosphorus and potash on the types of soils mentioned above."

Extract from Scientific Agriculture, Vol. XI., No. 3, November, 1930.

Another letter from a horticulturist in that state (1929) says:

"Some storage work was done on fruit from different fertilizer plots in 1920-21 and 1922, and again in 1925-26, and 1927. In no case did we find that the fertilizer had modified to a measurable degree the keeping quality of fruit produced.

"In several irrigated orchards nitrogen fertilizers did give a marked improvement in tree growth followed by a distinct increase in crop production. The crop produced was not distinguishable when taken from plots that had received nitrogen fertilizer only or from those that had received a complete fertilizer."

Still another from the Director of a Central States experiment station expresses the opinion that—

"Potash has a rather important influence. We have no definite information on that question other than some work with peaches where there was a very marked influence on the shipping quality. Strawberry growers in many sections feel that potash in particular has a very noticeable effect on the keeping of the fruit."

One experienced worked says that:

"We know that in general large size fruits do not hold as well as medium or small size fruits and that nitrogen fertilizers have a tendency to increase the size when sufficient moisture is available, but I feel that we have practically no evidence, one way or the other, relative to the value of "complete" fertilizers as compared to nitrogen only in improving the storage quality of the fruit."

LITERATURE

It is only comparatively recently that experimental work along this line has been reported, and it is not entirely in agreement. Archbold (*1*) analyzed apples from different localities and reports that "Most of the nitrogen is accumulated during the two months immediately following "setting" of the fruit, and this rapid intake of nitrogen is probably associated with the cell division which occurs at the same time. Starch and acid accumulation are found to be closely associated, and both follow the time of maximum nitrogen storage; the synthesis of starch and production of acid thus appear to be closely related in these apples." Further, he states that—"In all the apples examined high dry weight, high total sugar, and high sucrose values were found associated. In Bramley's Seedling from different orchards in the same locality nitrogen and sucrose were found to be inversely related, while in Worcester Pearmain the relation was direct. The difference in behavior is attributed to differences in metabolism due to the widely different acid contents of the two varieties." Storage studies are not included.

Haynes and Archbold (*5*) suggest that "The properties which favor keeping have been found to be: low nitrogen and high sucrose, and probably also a large amount of cell-wall material."

Weinberger (*8*) investigated the effect of potash on keeping quality of various fruits and reports that "So far, under various soils and climatic conditions in Maryland, the use of potassium fertilizers, whether alone, in combination with nitrogen, or with nitrogen and phosphorus, has not affected the firmness or keeping quality of apples, peaches, or strawberries."

Degman (*2*) working in the same state finds that "the application of nitrogen fertilizers has caused no consistent change in the keeping quality of apples or peaches, as indicated by pressure tests and storage counts. . .

However, there seems no doubt that when orchard practices, as pruning, soil management, thinning, irrigation, etc., are unwisely administered in connection with the use of nitrogen, resulting in the production of excessively large fruit, or when immature fruit is harvested, there will be a decrease in keeping quality, which is often incorrectly ascribed to the use of nitrogen."

Magness and Overly (*7*) working in the state of Washington find "no significant variation in the rate of softening as measured by the pressure test which could be attributed to fertilizer treatment."

While all of this work is significant and suggestive it is a question whether it has been carried on for a long enough period to answer the question finally. It is quite conceivable that the situation may vary under humid and irrigation conditions, under tillage and sod culture systems, and the many other variable conditions under which fruit is grown.

RESULTS IN OHIO

In the hope of throwing some light upon this vexing problem of "breakdown" or premature softening of apples, the writer laid out a series of experiments at the Ohio Experiment Station in 1927, although some preliminary observations had previously been made. (*3*). Orchards in sod and tillage were used, and several varieties included.

Physiological breakdown has not been common in the Station orchards although in 1929 it was quite prevalent. The trouble varies somewhat in its characteristics but consists essentially in a softening of the cortical tissue of the apple. Often it begins with a darkening of the vascular tissue adjacent to the carpels. The pith region often darkens and softens also, followed by irregular softening just beneath the skin. Sometimes the flesh softens quickly throughout without the previous darkening in the region of the carpels. We do not wish to create the impression that physiological breakdown does not occur nor minimize its seriousness. It is rather a question of what causes the trouble, and of seeking a remedy.

STORAGE RESULTS

The chief interest of the orchardist in this connection is in the behavior of fruit in storage. If samples from one treatment behave differently from those of another some clue may be given as to the cause. Consequently we have taken from one to three bushels from each treatment and held them in a well constructed common or air-cooled storage and the individual apples were examined periodically through the storage season. Shriveling, scalding and decay from other causes are also recorded, but the chief interest has been in physiological breakdown.

As will be seen below there is a striking difference in the nitrogen content of fruit which has been treated with nitrogenous fertilizer, yet the storage data indicate no measurable difference between lots which have not been fertilized at all and those which have had heavy applications. This is not in line with certain experiments which have been run elsewhere with such crops as celery and other succulent vegetative parts. As a matter of fact our observation has shown that it is the most highly colored fruits of such varieties as Jonathan and Stayman Winesap which show the earliest and greatest amount of breakdown. These highly colored apples would represent those high in sugars and other forms of carbohydrates in contrast to those that are not so

well colored which would be likely to analyze proportionately higher in nitrogen.

While an effort was made to select typical fruits free of blemishes, punctures, bruises, etc., it was found that some of these blemishes were included, or that slight injuries occurred in handling the fruit during the storage season. In such cases storage decays and storage rots were likely to follow, and such results should not be correlated with the cultural treatment of the fruit. With early varieties, such as Wealthy, there was considerable decay before the end of the storage season while with such a winter variety as Stayman but little decay occurred. The following data on Wealthy and Stayman will show these results as carried on during the period of investigation. The Wealthy are young trees and are cultivated while the Stayman are older trees and grown in sod.

TABLE I. *Storage Results, 1928-1929, with Fruit from Cultivated Orchard, Planted 1922.*

Treatment WEALTHY	Plot	Per Cent Sound		Per Cent Shriveled		Per Cent Decay		Per Cent Scalded	
		Oct. 17	Nov. 14	Oct. 17	Nov. 14	Oct. 17	Nov. 14	Oct.17	Nov. 14
5¼ lbs. nitrate	1-9 trees	89.8	60.2	3.4	29.6	6.8	10.2	0	0
1¾ lbs. nitrate	2 "	91.9	69.8	2.3	16.3	5.8	13.9	0	0
Complete fert.	3 "	91.6	68.4	4.2	15.8	4.2	15.8	0	0
1¾ lbs. nitrate	4 "	86.8	62.8	7.8	26.4	5.4	10.8	0	0
Nit. & Super. phos.	5 "	91.6	79.4	4.6	13.7	3.8	6.9	0	0
1¾ lbs. nitrate	6 "	91.3	72.4	.8	10.2	7.9	17.4	0	0
Nit. & Mur. potash	7 "	95.3	68.4	2.0	21.5	2.7	10.1	0	0
1¾ lbs. nitrate	8 "	85.7	62.5	14.3	37.5	0.0	0.0	0	0
No fertilizer	9 "	84.1	64.6	6.2	19.5	9.7	15.9	0	0
Average of normal nitrate plots		88.9	66.9	6.3	22.6	4.8	10.5	0	0

TABLE 2.—*Storage results. Stayman Winesap, in sod, planted 1915. Per cent decay or breakdown.*

1927 April			1928 March			1929 April		
NaNo3	lb.	Decay %	NaNo3	lbs.	Decay %	NaNo3	lbs.	Decay %
2¾		1.6	3		4.1	3¼		0.0
			6		0.86	7		0.4
			8		0.7	10		0.5
			12		0.0	14		0.0
12		4.9	14		2.2	17½		0.0

Though the differences in young trees in cultivation were not so great as those just discussed, they were consistent and rather marked as to the nitrogen content of the fruits. Of six analyses made at different times on fruit from Jonathan trees, an increase in the percentage of nitrogen of the treated over the control was shown in every instance and the grams of nitrogen per 15 fruits was greater in five of the six cases. Fruit from Stayman trees in cultivation also showed marked increase in nitrogen when the trees were fertilized for each of three samples taken in 1929. Two samples from McIntosh trees showed the same. The case of apples from Wealthy trees in cultivation is interesting. One sample taken in 1928 showed an increase of 46.0% in the percentage of nitrogen in the fruit of the treated row (5¼ lbs. per tree) over the control, or calculated on the basis of total grams of nitrogen per sample, 47.2%. The next season August 15, 1929,

samples were taken from these same trees as follows: in the control row and from each of five trees in the treated row. The results, as given in Table 5, indicate an increase in the nitrogen in the fruit which is undoubtedly significant. The average weight of fruits is also considerably greater for the treated row, while the moisture content is somewhat greater.

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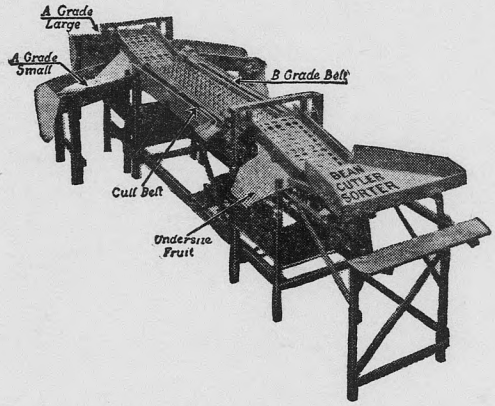
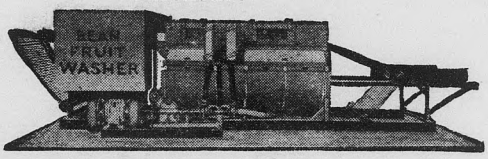
1931 Cutler Graders in both weight type and diameter sizing principle furnished in all sizes from small growers model to largest warehouse size.



1931 Cutler and Bean Fruit Washers not only remove arsenical residues but **all other** spray residues, dust, dirt, aphis and leaf hopper blemishes. Available in three sizes:—

Small Growers Model
Large " "
Warehouse "



Improved Bean-Moe Cloth type polishers for peaches and apples.

New Bean Brush type polisher.

Send for our descriptive circulars and prices on this packing house equipment.

JOHN BEAN MFG. CO.

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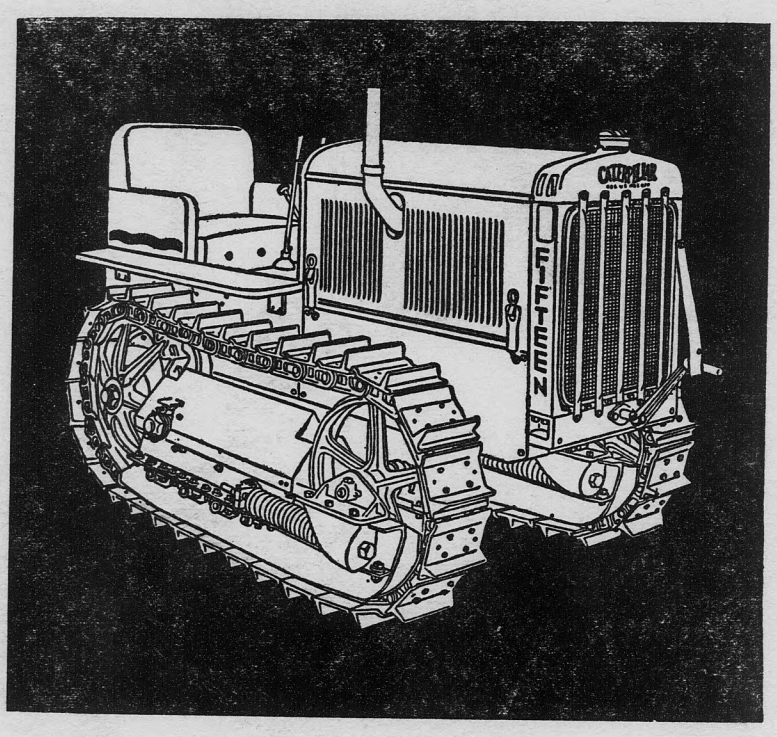

"CATERPILLAR" Tractors

POSITIVE TRACTION
DEPENDABLE POWER
ECONOMICAL OPERATION

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